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SUPPLEMENTARY INFORMATION
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Predator traits determine food-web architecture across ecosystems

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Contents

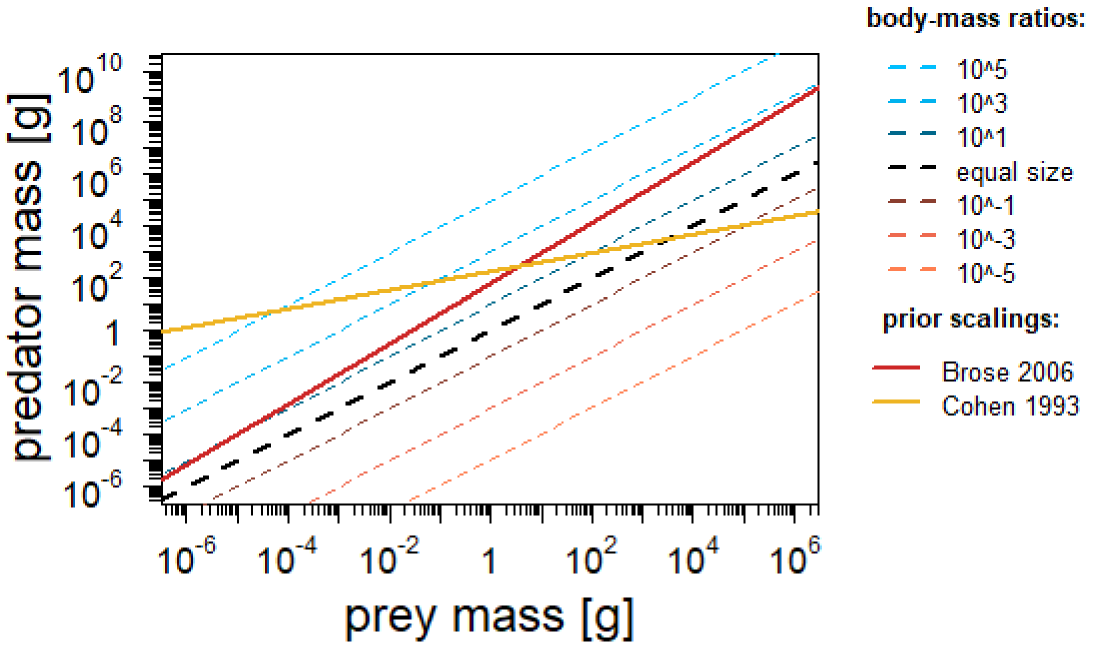

Fig. 1: Concept of the predator prey body mass scaling approach.
On the predator-prey body-mass plot, diagonal lines represent predator-prey body-mass ratios (black dashed line for equally sized species, blue and red dashed lines for ratios higher and lower than unity, respectively). Red and yellow solid lines show two prior scaling relationships implying decreases (yellow) or increases (red) in body-mass ratios with prey (and predator) mass. All body masses are gram fresh masses.

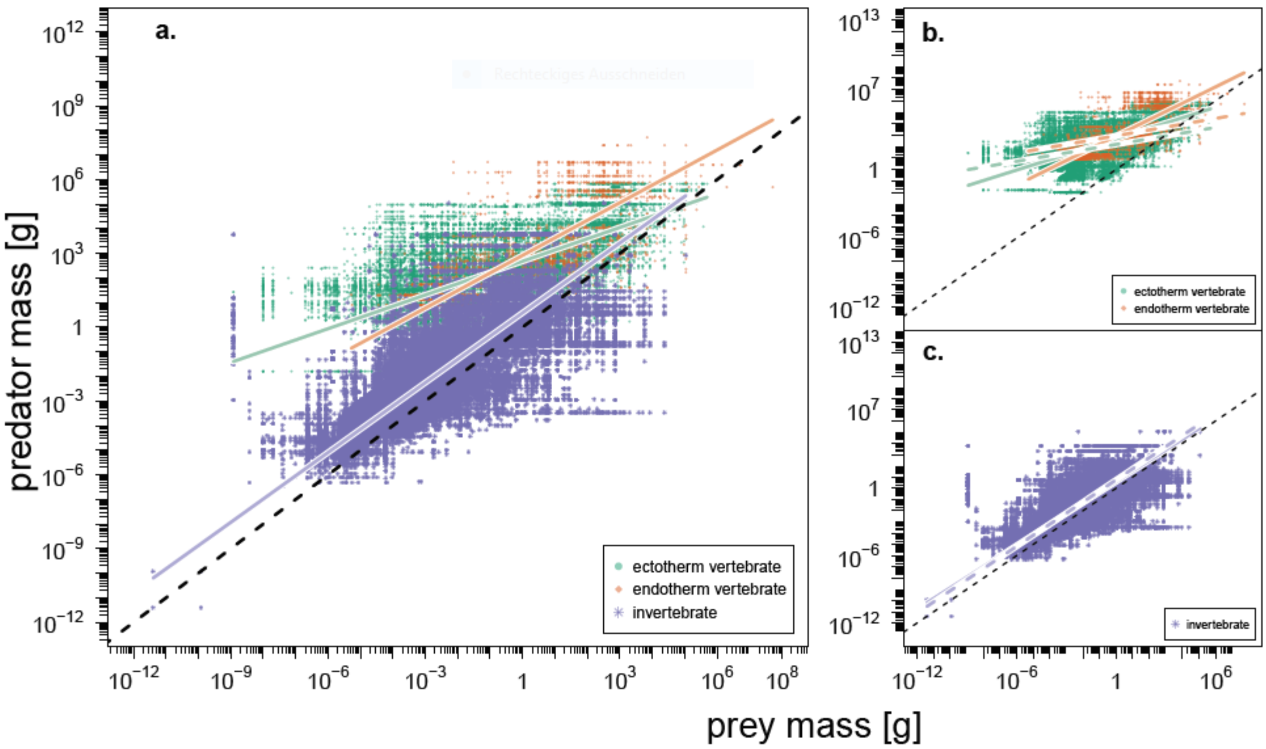

Fig. 2: Predator metabolic types constrain the scaling of predator and prey body mass. **(a)** All metabolic types, **(b)** ectotherm and endotherm vertebrates, **(c)** invertebrates. All body masses are gram fresh masses. Coloured lines show regression relationships obtained by Bayesian major axis regressions (solid lines) and Bayesian mixed major axis regressions (dashed lines). See methods of the main manuscript for statistical details. Black dashed lines indicate equal body masses of predator and prey for comparisons. See Supplementary Table S3 for model parameters.

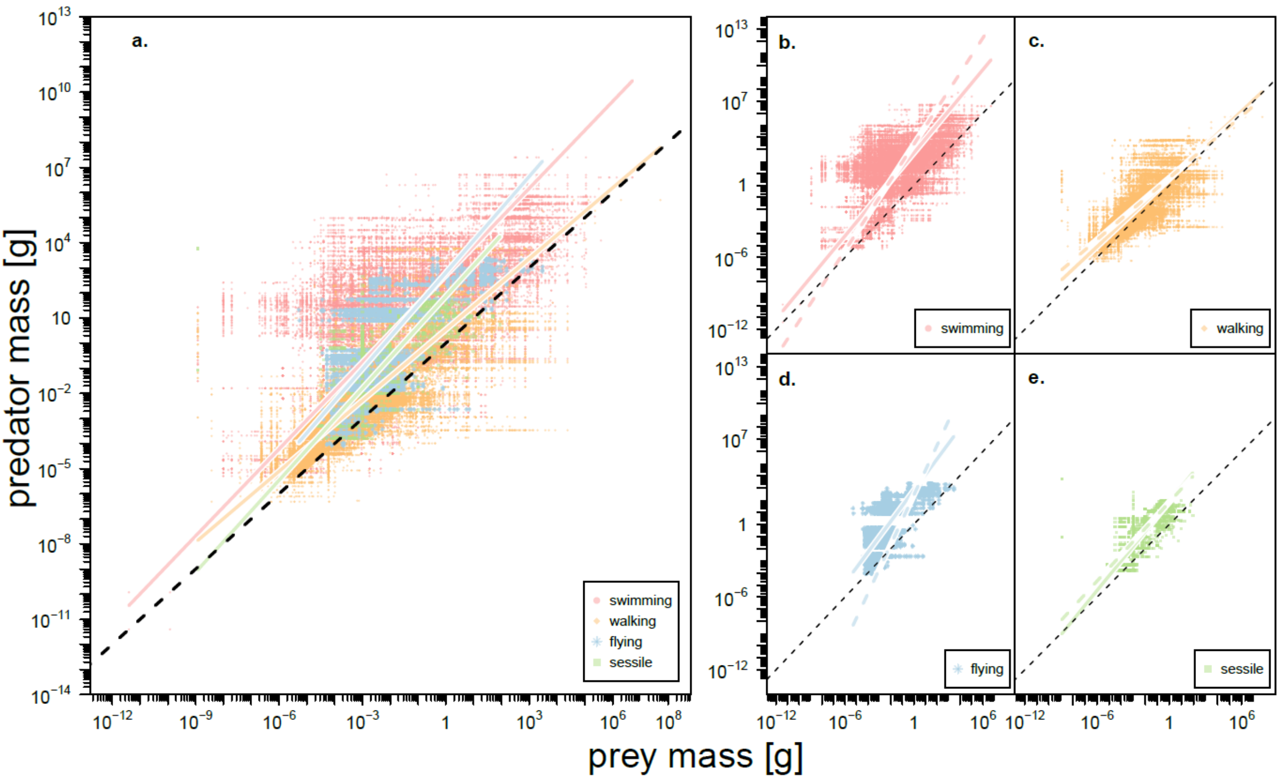

Fig. 3: Predator movement types constrain the scaling of predator and prey body mass. **(a)** All movement types, **(b)** swimming, **(c)** walking, **(d)** flying, **(e)** sessile predators. All body masses are gram fresh weights. Coloured lines show regression relationships obtained by Bayesian major axis regressions (solid lines) and Bayesian mixed major axis regressions (dashed lines). See methods of the main manuscript for statistical details. Black dashed lines indicate equal body masses of predator and prey for comparisons. See Supplementary Table S3 for model parameters.

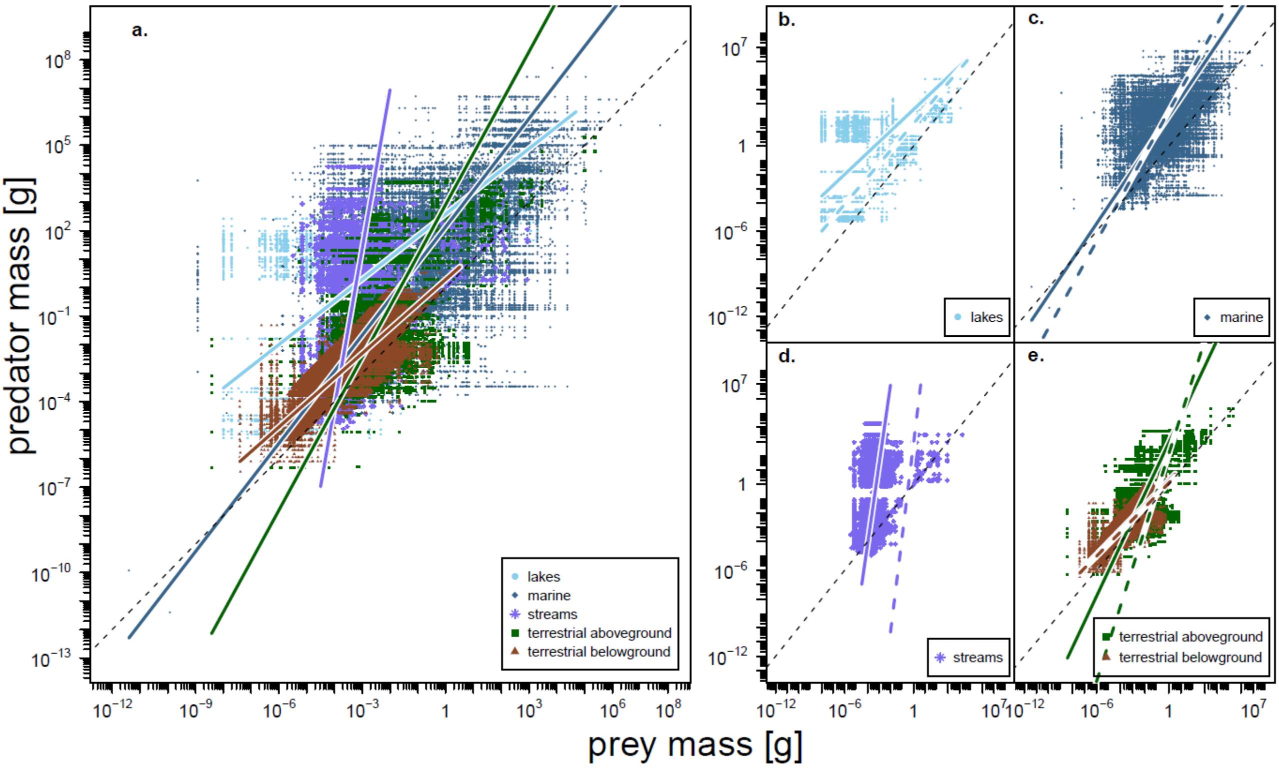

Fig. 4: Ecosystem types constrain the scaling of predator and prey body mass. **(a)** All ecosystem types, **(b)** lakes, **(c)** marine, **(d)** streams, **(e)** terrestrial above- and belowground ecosystems. All body masses are gram fresh weights. Coloured lines show regression relationships obtained by Bayesian major axis regressions (solid lines) and Bayesian mixed major axis regressions (dashed lines). See methods of the main manuscript for statistical details. Black dashed lines indicate equal body masses of predator and prey for comparisons. See Supplementary Table S3 for model parameters.

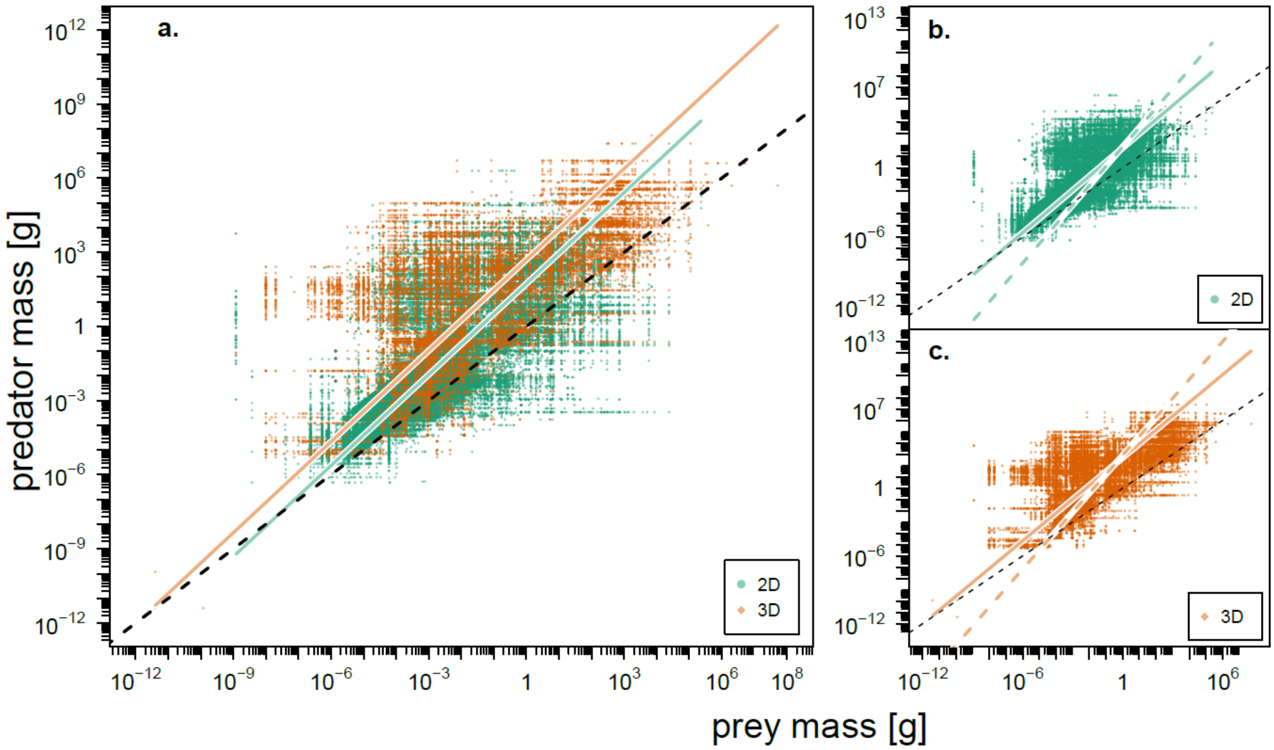

Fig. 5: Interaction dimensionality constrains the scaling of predator and prey body mass. **(a)** All interaction dimensionalities, **(b)** 2D, **(c)** 3D interactions. All body masses are gram fresh weights. Coloured lines show regression relationships obtained by Bayesian major axis regressions (solid lines) and Bayesian mixed major axis regressions (dashed lines). See methods of the main manuscript for statistical details. Black dashed lines indicate equal body masses of predator and prey for comparisons. See Supplementary Table S3 for model parameters.

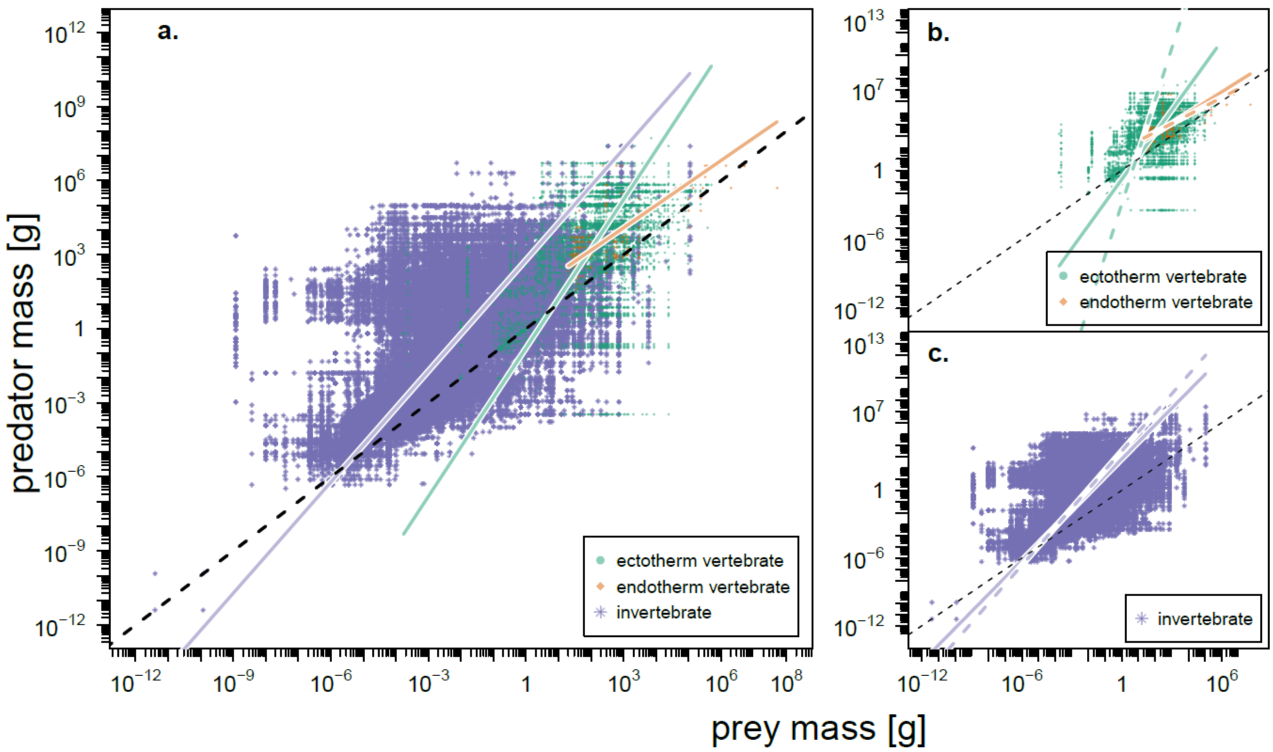

Fig. 6: Prey metabolic types constrain the scaling of predator and prey body mass. **(a)** All metabolic types, **(b)** ectotherm and endotherm vertebrates, **(c)** invertebrates. All body masses are gram fresh weights. Coloured lines show regression relationships obtained by Bayesian major axis regressions (solid lines) and Bayesian mixed major axis regressions (dashed lines). See methods of the main manuscript for statistical details. Black dashed lines indicate equal body masses of predator and prey for comparisons. See Supplementary Table S3 for model parameters.

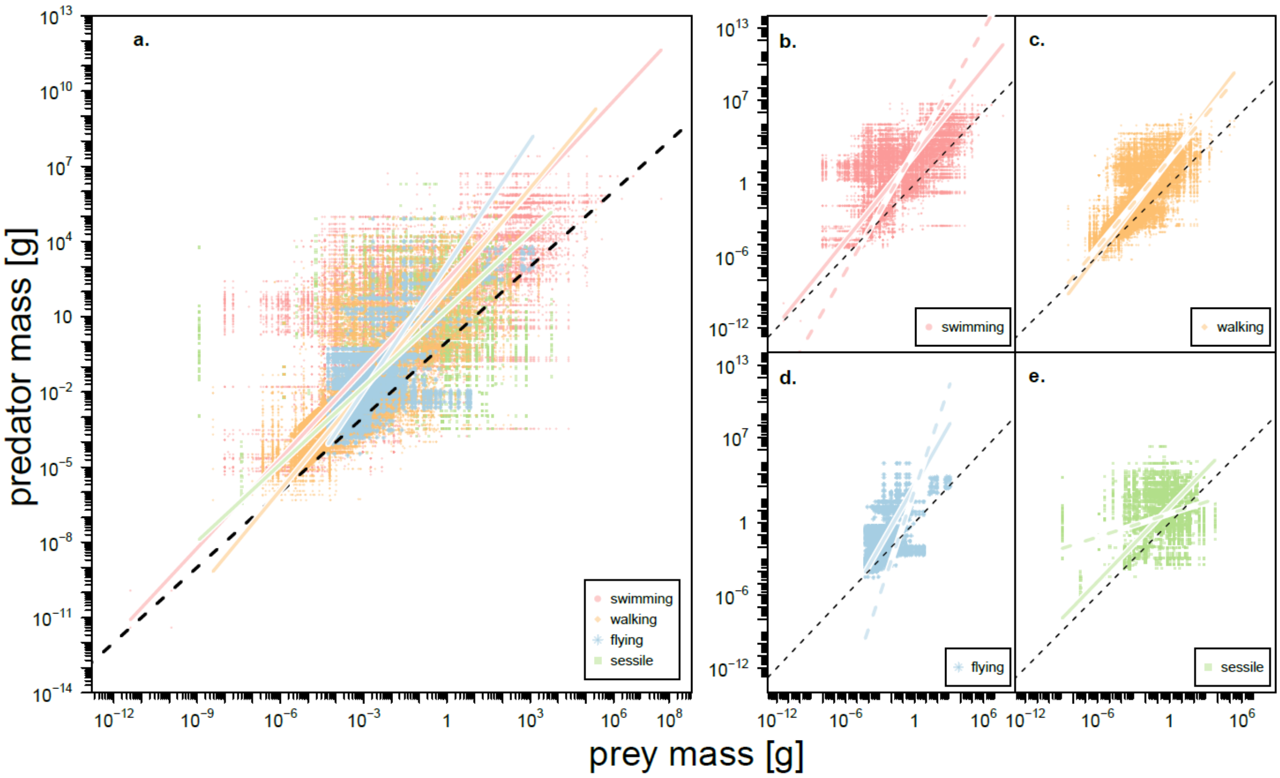

Fig. 7: Prey movement types constrain the scaling of predator and prey body mass. **(a)** All movement types, **(b)** swimming, **(c)** walking, **(d)** flying, **(e)** sessile prey. All body masses are gram fresh weights. Coloured lines show regression relationships obtained by Bayesian major axis regressions (solid lines) and Bayesian mixed major axis regressions (dashed lines). See methods of the main manuscript for statistical details. Black dashed lines indicate equal body masses of predator and prey for comparisons. See Supplementary Table S3 for model parameters.

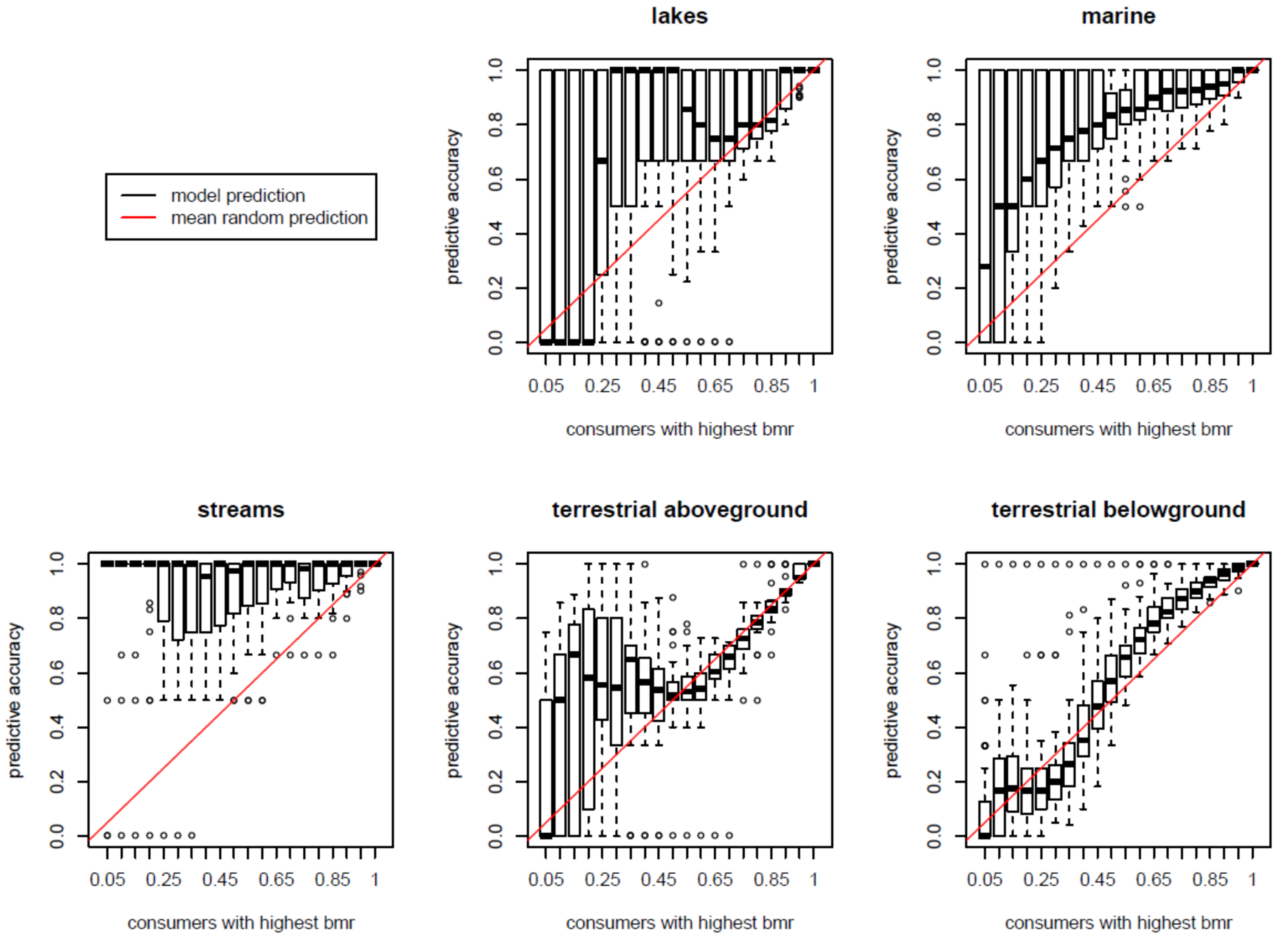

Fig. 8: Accuracy of the predator trait model across ecosystem types.
The diagonal line characterizes predictions when predators are chosen at random.
Accuracy is the proportion of correct predictions.

Table 1: Food webs of the dataset.

foodweb name	study site	geographic location	citation	longitude	latitude	ecosystem type
Grand Caricaie marsh Clmown1	Grand Caricaie	Switzerland, Lake Neuchatel	(Cattin Blandenier 2004)	6.98182	46.93845	terrestrial aboveground
Grand Caricaie marsh Clmown2	Grand Caricaie	Switzerland, Lake Neuchatel	(Cattin Blandenier 2004)	6.98182	46.93845	terrestrial aboveground
Grand Caricaie marsh ClControl1	Grand Caricaie	Switzerland, Lake Neuchatel	(Cattin Blandenier 2004)	6.98683	46.94191	terrestrial aboveground
Grand Caricaie marsh ClControl2	Grand Caricaie	Switzerland, Lake Neuchatel	(Cattin Blandenier 2004)	6.98683	46.94191	terrestrial aboveground
Grand Caricaie marsh Scmown1	Grand Caricaie	Switzerland, Lake Neuchatel	(Cattin Blandenier 2004)	6.98483	46.94044	terrestrial aboveground
Grand Caricaie marsh Scmown2	Grand Caricaie	Switzerland, Lake Neuchatel	(Cattin Blandenier 2004)	6.98483	46.94044	terrestrial aboveground
Grand Caricaie marsh ScControl1	Grand Caricaie	Switzerland, Lake Neuchatel	(Cattin Blandenier 2004)	6.98729	46.94102	terrestrial aboveground
Grand Caricaie marsh ScControl2	Grand Caricaie	Switzerland, Lake Neuchatel	(Cattin Blandenier 2004)	6.98729	46.94102	terrestrial aboveground
Ythan Estuary	River Ythan	Aberdeen, Scotland	(Cohen *et al.* 2009)	-2.001119	57.33845	marine
AEW01	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	9.33	48.48	terrestrial belowground
AEW02	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	9.35	48.38	terrestrial belowground
AEW03	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	9.36	48.41	terrestrial belowground
AEW04	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	9.24	48.4	terrestrial belowground
AEW05	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	9.41	48.42	terrestrial belowground
AEW06	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	9.45	48.39	terrestrial belowground
AEW07	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	9.26	48.4	terrestrial belowground
AEW08	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	9.38	48.38	terrestrial belowground
AEW09	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	9.42	48.37	terrestrial belowground
AEW11	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	9.32	48.49	terrestrial belowground
AEW17	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	9.24	48.4	terrestrial belowground
AEW18	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	9.23	48.37	terrestrial belowground

Table 1: Continued

foodweb name	study site	geographic location	Citation	longitude	latitude	ecosystem type
AEW25	Biodiversity Exploratories	Germany	(Digel et al. 2014)	9.42	48.48	terrestrial belowground
AEW27	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	9.47	48.4	terrestrial belowground
AEW30	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	9.37	48.37	terrestrial belowground
AEW49	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	9.48	48.45	terrestrial belowground
HEW01	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.32	51.19	terrestrial belowground
HEW02	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.37	51.21	terrestrial belowground
HEW03	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.31	51.27	terrestrial belowground
HEW04	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.53	51.37	terrestrial belowground
HEW05	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.24	51.26	terrestrial belowground
HEW06	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.24	51.27	terrestrial belowground
HEW10	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.46	51.09	terrestrial belowground
HEW11	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.4	51.1	terrestrial belowground
HEW12	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.46	51.1	terrestrial belowground
HEW13	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.31	51.24	terrestrial belowground
HEW16	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.37	51.18	terrestrial belowground
HEW17	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.23	51.28	terrestrial belowground
HEW21	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.32	51.19	terrestrial belowground
HEW22	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.36	51.34	terrestrial belowground
HEW36	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.41	51.11	terrestrial belowground
HEW47	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	10.38	51.18	terrestrial belowground
SEW01	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.85	52.9	terrestrial belowground
SEW02	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.78	52.95	terrestrial belowground
SEW03	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.64	52.92	terrestrial belowground
SEW04	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.85	52.92	terrestrial belowground
SEW05	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.89	53.06	terrestrial belowground
SEW06	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.84	52.91	terrestrial belowground
SEW07	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.69	53.11	terrestrial belowground
SEW08	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.93	53.19	terrestrial belowground
SEW09	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.81	53.04	terrestrial belowground
SEW18	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.92	52.86	terrestrial belowground

Table 1: Continued

foodweb name	*study site*	geographic location	Citation	longitude	Latitude	ecosystem type
SEW35	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.85	52.91	terrestrial belowground
SEW36	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.75	52.95	terrestrial belowground
SEW37	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.78	52.94	terrestrial belowground
SEW41	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.91	52.91	terrestrial belowground
SEW43	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.93	52.9	terrestrial belowground
SEW48	Biodiversity Exploratories	Germany	(Digel *et al.* 2014)	13.84	53.05	terrestrial belowground
Kongsfjorden	Arctic Shelf Area	Arctis	(Eklof *et al.* 2013)	11.645	79.039	marine
Alford lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.04	44.26	lakes
Balsam lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.8	43.63	lakes
Beaver lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.75	43.65	lakes
Big hope lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.13	44.51	lakes
Brandy lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.36	44.28	lakes
Bridge brook lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.57	44.16	lakes
Brook trout lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.66	43.6	lakes
Buck pond	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-75.06	43.53	lakes
Burntbridge lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.71	44.21	lakes
Cascade lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.81	43.79	lakes
Chub lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.79	43.83	lakes
Chub pond	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-75.06	43.55	lakes
Connera lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-73.94	44.31	lakes
Constable lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.81	43.83	lakes
Deep lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.66	43.62	lakes
Emerald lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-75.02	44.02	lakes
Falls lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.68	43.63	lakes
Fawn lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.78	43.71	lakes
Federation lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.41	44.34	lakes
Goose lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.9	43.78	lakes
Grass lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.35	44.38	lakes
Gull lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-75.07	43.55	lakes
Gull lake north	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.82	43.86	lakes
Helldiver pond	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.7	43.67	lakes

Table 1: Continued

foodweb name	study site	geographic location	citation	longitude	latitude	ecosystem type
High pond	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.66	44.09	lakes
Hoel lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.36	44.36	lakes
Horseshoe Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.36	44.32	lakes
Indian Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.76	43.62	lakes
Little Rainbow Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.33	44.36	lakes
Long Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-73.93	44.32	lakes
Loon Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.17	44.49	lakes
Lost Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.28	44.46	lakes
Lost Lake East	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.67	43.69	lakes
Lower Sister Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.78	43.87	lakes
Oswego Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.9	43.85	lakes
Owl Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.15	44.27	lakes
Rat Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.31	44.35	lakes
Razorback Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.92	43.85	lakes
Rock Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-75.02	44.01	lakes
Russian Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.81	43.84	lakes
Safford Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.92	43.78	lakes
Sand Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-75.01	44.01	lakes
South Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.88	43.84	lakes
Squaw Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.74	43.64	lakes
Stink Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.81	43.63	lakes
Twelfth Tee Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.34	44.34	lakes
Twin Lake East	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.64	43.62	lakes
Twin Lake West	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.64	43.62	lakes
Whipple Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.3	44.39	lakes
Wolf Lake	Adirondack lakes	USA	(Sutherland 1989; Havens 1992)	-74.66	43.63	lakes
Weddell Sea	Eastern Weddell Sea Shelf	Antarctica	(Jacob *et al.* 2011)	-45	-73	marine
Tuesday Lake 1984	Tuesday Lake	USA, Michigan	(Jonsson *et al.* 2005)	-89.497	46.251182	lakes
Tuesday Lake 1986	Tuesday Lake	USA, Michigan	(Jonsson *et al.* 2005)	-89.497	46.251182	lakes

Table 1: Continued

foodweb name	study site	geographic location	citation	longitude	latitude	ecosystem type
Chilean Intertidal Curaumilla	Intertidal study sites in Chile : Curaumilla	Chile	(Kéfi *et al.* 2015)	-71.6556	-33.029307	marine
Chilean Intertidal El Quisco	Intertidal study sites in Chile: El Quisco	Chile	(Kéfi *et al.* 2015)	-71.69609	-33.366273	marine
Chilean Intertidal Las Cruces	Intertidal study sites in Chile: Las Cruces (ECIM)	Chile	(Kéfi *et al.* 2015)	-71.6443	-33.494839	marine
Chilean Intertidal Los Molles	Intertidal study sites in Chile: Los Molles	Chile	(Kéfi *et al.* 2015)	-71.5261	-32.236792	marine
Chesapeake Bay	Chesapeake Bay	USA	(Kroll, unpublished)	-76.13132	37.492083	marine
Carpinteria	California salt marsh	Santa Barbara, California, USA	(Lafferty *et al.* 2006)	-119.5376	34.400713	terrestrial aboveground
Scottish Lake	Lochnagar	Lochnagar, NE Scotland, UK	(Layer *et al.* 2010)	-3.231455	56.958	lakes
Afon Hafren 2005	UK Streams	UK	(Layer *et al.* 2010)	-3.7	52.47	streams
Allt a Mharcaidh	UK Streams	UK	(Layer *et al.* 2010)	-3.85	57.12	streams
Broadstone Stream	UK Streams	UK	(Layer *et al.* 2010)	0.05	51.08	streams
Dargall Lane	UK Streams	UK	(Layer *et al.* 2010)	-4.43	55.08	streams
Duddon Pike Beck	UK Streams	UK	(Layer *et al.* 2010)	-3.17	54.41	streams
Hardknott Gill	UK Streams	UK	(Layer *et al.* 2010)	-3.17	54.4	streams
Mill Stream	UK Streams	UK	(Layer *et al.* 2010)	-2.18	50.68	streams
Mosendale Beck	UK Streams	UK	(Layer *et al.* 2010)	-3.14	54.41	streams
Old Lodge	UK Streams	UK	(Layer *et al.* 2010)	0.08	51.04	streams
Alert	Alert	High arctic terrestrial field sites	(Legagneux *et al.* 2014)	-62.387641	82.512274	terrestrial aboveground
Bylot	Bylot	High arctic terrestrial field sites	(Legagneux *et al.* 2014)	-78.907736	73.157854	terrestrial aboveground
Herschel	Herschel	High arctic terrestrial field sites	(Legagneux *et al.* 2014)	-139.171914	69.599884	terrestrial aboveground
Nenetsky	Nenetsky	High arctic terrestrial field sites	(Legagneux *et al.* 2014)	56.103396	68.206261	terrestrial aboveground
Svalbard	Svalbard	High arctic terrestrial field sites	(Legagneux *et al.* 2014)	18.25975	78.794285	terrestrial aboveground
Yamal	Yamal	High arctic terrestrial field sites	(Legagneux *et al.* 2014)	69.543485	70.100652	terrestrial aboveground
Zackenberg	Zackenberg	High arctic terrestrial field sites	(Legagneux *et al.* 2014)	-20.426879	74.519046	terrestrial aboveground
Gearagh	Gearagh woodland	The Gearagh, South-West Cork, Ireland	(McLaughlin *et al.* 2010)	-8.99811	51.885104	terrestrial aboveground

Table 1: Continued

foodweb name	study site	geographic location	Citation	longitude	latitude	ecosystem type
Dutch Detrital food web PlotA	DutchSoil	Soest, Netherlands	(Mulder & Elser 2009; Sechi *et al.* 2015)	5.300059	52.149957	terrestrial aboveground
Dutch Detrital food web PlotB	DutchSoil	Soest, Netherlands	(Mulder & Elser 2009; Sechi *et al.* 2015)	5.300059	52.149957	terrestrial aboveground
Dutch Detrital food web PlotC	DutchSoil	Soest, Netherlands	(Mulder & Elser 2009; Sechi *et al.* 2015)	5.300059	52.149957	terrestrial aboveground
Bure Stream	UK streams	United Kingdom	(Gray *et al.* 2015; Thompson *et al.* 2017)	1.2	52.82	streams
Loddon Stream	UK streams	United Kingdom	(Gray *et al.* 2015; Thompson *et al.* 2017)	-1.02	51.29	streams
Lyde Stream	UK streams	United Kingdom	(Gray *et al.* 2015; Thompson *et al.* 2017)	-1	51.29	streams
Test Stream	UK streams	United Kingdom	(Gray *et al.* 2015; Thompson *et al.* 2017)	-1.47	51.14	streams
Wensum Stream	UK streams	United Kingdom	(Gray *et al.* 2015; Thompson *et al.* 2017)	0.95	52.78	streams
Lake Malawi	East African Lakes	Tanzania	(Nsiku 1999)	34.490113	-11.61406	lakes
Iceland stream IS7 April 2009	Iceland streams	Iceland	(O'Gorman *et al.* 2012)	-21.307673	64.056531	Streams
Iceland stream IS7 August 2008	Iceland streams	Iceland	(O'Gorman *et al.* 2012)	-21.307673	64.056531	streams
Iceland stream IS8 April 2009	Iceland streams	Iceland	(O'Gorman *et al.* 2012)	-21.307716	64.056648	streams
Iceland stream IS8 August 2008	Iceland streams	Iceland	(O'Gorman *et al.* 2012)	-21.307716	64.056648	streams
Caribbean Reef	Puerto Rico-Virgin Islands (PRVI) shelf complex	Puerto Rico-Virgin Islands (PRVI) shelf complex	(Opitz 1996)	-64.784438	18.316891	marine
FloridaIslandE1	Florida mangrove islands	Florida Key islands, Florida Bay, USA	(Simberloff & Wilson 1969; Piechnik *et al.* 2008)	-81.6279076	24.677388 5	terrestrial aboveground

Table 1: Continued

foodweb name	study site	geographic location	citation	longitude	latitude	ecosystem type
FloridaIslandE2	Florida mangrove islands	Florida Key islands, Florida Bay, USA	(Simberloff & Wilson 1969; Piechnik *et al.* 2008)	-81.6876083	24.6776319	terrestrial aboveground
FloridaIslandE3	Florida mangrove islands	Florida Key islands, Florida Bay, USA	(Simberloff & Wilson 1969; Piechnik *et al.* 2008)	-81.5506505	24.6904173	terrestrial aboveground
FloridaIslandE7	Florida mangrove islands	Florida Key islands, Florida Bay, USA	(Simberloff & Wilson 1969; Piechnik *et al.* 2008)	-80.7105813	25.2362402	terrestrial aboveground
FloridaIslandE9	Florida mangrove islands	Florida Key islands, Florida Bay, USA	(Simberloff & Wilson 1969; Piechnik *et al.* 2008)	-80.7476947	25.0336964	terrestrial aboveground
Lough Hyne	Lough Hyne	Ireland, West Cork, Skibbereen	(Jacob *et al.* 2015)	-9.3	51.5	marine
Blackrock Stream	New Zealand streams	Tributaries of the Taieri River, New Zealand	(Townsend *et al.* 1998)	169.289707	-46.055878	streams
Broad Stream	New Zealand streams	Tributaries of the Taieri River, New Zealand	(Townsend *et al.* 1998)	169.288684	-46.053684	streams
Canton Creek	New Zealand streams	Tributaries of the Taieri River, New Zealand	(Townsend *et al.* 1998)	169.289214	-46.055502	streams
Dempsters Stream	New Zealand streams	Tributaries of the Taieri River, New Zealand	(Townsend *et al.* 1998)	170.622448	-45.187583	streams
German Creek	New Zealand streams	Tributaries of the Taieri River, New Zealand	(Townsend *et al.* 1998)	170.276131	-44.976627	streams
Healy Creek	New Zealand streams	Tributaries of the Taieri River, New Zealand	(Townsend *et al.* 1998)	170.621302	-45.181259	streams
Kye Burn	New Zealand streams	Tributaries of the Taieri River, New Zealand	(Townsend *et al.* 1998)	170.621041	-45.181433	streams
Little Kye Burn	New Zealand streams	Tributaries of the Taieri River, New Zealand	(Townsend *et al.* 1998)	170.622448	-45.187583	streams
Stony Stream	New Zealand streams	Tributaries of the Taieri River, New Zealand	(Townsend *et al.* 1998)	169.34563	-45.15484	streams

Table 1: Continued

foodweb name	study site	geographic location	Citation	longitude	latitude	ecosystem type
Sutton Stream	New Zealand streams	Tributaries of the Taieri River, New Zealand	(Townsend *et al.* 1998)	169.345868	-45.155118	streams
AP1	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.407827	-23.812962	marine
AP2	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.407856	-23.812993	marine
AP3	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.407884	-23.813024	marine
AP4	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.407984	-23.813107	marine
BP1	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.166796	-23.524249	marine
BP2	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.166698	-23.524136	marine
BP3	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.166716	-23.523881	marine
CGP1	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.421782	-23.822600	marine
CGP2	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.421768	-23.82601	marine
CGP3	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.421779	-23.825912	marine
CR1P1	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.485974	38.709952	marine
CR1P2	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.485945	38.710015	marine
CR1P3	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.486042	38.709936	marine
CR1P4	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.486071	38.709946	marine
CR2P1	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.486132	38.710621	marine
CR2P2	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.486068	38.71063	marine
CR2P3	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.485978	38.71067	marine
CR2P4	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.485925	38.710653	marine
F1P1	Intertidal rocky pools	Moz	(Vinagre et al., unpublished)	32.991403	-25.969864	marine
F1P2	Intertidal rocky pools	Moz	(Vinagre et al., unpublished)	32.991658	-25.969947	marine
F1P3	Intertidal rocky pools	Moz	(Vinagre et al., unpublished)	32.992506	-25.970258	marine
F1P4	Intertidal rocky pools	Moz	(Vinagre et al., unpublished)	32.992661	-25.970464	marine
F2P1	Intertidal rocky pools	Moz	(Vinagre et al., unpublished)	32.993669	-25.971056	marine
F2P2	Intertidal rocky pools	Moz	(Vinagre et al., unpublished)	32.993579	-25.971186	marine
F2P3	Intertidal rocky pools	Moz	(Vinagre et al., unpublished)	32.993542	-25.971569	marine
F2P4	Intertidal rocky pools	Moz	(Vinagre et al., unpublished)	32.99355	-25.971744	marine
FP1	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.157673	-23.529452	marine
FXAP1	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.26622	-3.2116634	marine

Table 1: Continued

foodweb name	study site	geographic location	citation	longitude	latitude	ecosystem type
FXAP2	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.266191	-3.216738	marine
FXAP3	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.26613	-3.216667	marine
FXAP4	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.266168	-3.216639	marine
FXBP1	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.268045	-3.217707	marine
FXBP2	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.267981	-3.217727	marine
FXBP3	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.268296	-3.217815	marine
FXBP4	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.26822	-3.217817	marine
GJAP1	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.230439	-3.23754	marine
GJAP2	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.230434	-3.237669	marine
GJAP3	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.230841	-3.237576	marine
GJAP4	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.230302	-3.23772	marine
GJBP1	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.228635	-3.239132	marine
GJBP2	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.228463	-3.2391122	marine
GJBP3	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.228519	-3.239011	marine
GJBP4	Intertidal rocky pools	Brazil (CE)	(Vinagre et al., unpublished)	-39.228493	-3.239112	marine
L1P1	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.340457	39.286564	marine
L1P2	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.340603	39.286564	marine
L1P3	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.340573	39.286584	marine
L1P4	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.340555	39.286595	marine
L2P1	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.339798	39.286558	marine
L2P2	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.339799	39.286575	marine
L2P3	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.339838	39.286569	marine
L2P4	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.33968	39.286623	marine
L3P1	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.343516	39.241002	marine
L3P2	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.343491	39.240973	marine
L3P3	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.343438	39.241035	marine
L3P4	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.343384	39.241023	marine
L4P1	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.343066	39.241695	marine
L4P2	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.343151	39.241695	marine
L4P3	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.343242	39.241812	marine

Table 1: Continued

foodweb name	study site	geographic location	citation	longitude	latitude	ecosystem type
L4P4	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.343138	39.241808	marine
MBP1	Intertidal rocky pools	England	(Vinagre et al., unpublished)	-4.127006	50.357325	marine
MBP2	Intertidal rocky pools	England	(Vinagre et al., unpublished)	-4.127097	50.357154	marine
MBP3	Intertidal rocky pools	England	(Vinagre et al., unpublished)	-4.12809	50.358082	marine
MBP4	Intertidal rocky pools	England	(Vinagre et al., unpublished)	-4.12802	50.358041	marine
PC1P1	Intertidal rocky pools	Madeira	(Vinagre et al., unpublished)	-16.826017	32.775718	marine
PC1P2	Intertidal rocky pools	Madeira	(Vinagre et al., unpublished)	-16.826053	32.775723	marine
PC1P3	Intertidal rocky pools	Madeira	(Vinagre et al., unpublished)	-16.825975	32.775719	marine
PC1P4	Intertidal rocky pools	Madeira	(Vinagre et al., unpublished)	-16.825992	32.775718	marine
PC2P1	Intertidal rocky pools	Madeira	(Vinagre et al., unpublished)	-16.825909	32.775966	marine
PC2P2	Intertidal rocky pools	Madeira	(Vinagre et al., unpublished)	-16.825893	32.775963	marine
PC2P3	Intertidal rocky pools	Madeira	(Vinagre et al., unpublished)	-16.825907	32.776023	marine
PC2P4	Intertidal rocky pools	Madeira	(Vinagre et al., unpublished)	-16.825883	32.776016	marine
PC2P5	Intertidal rocky pools	Madeira	(Vinagre et al., unpublished)	-16.82587	32.77602	marine
PGSBP1	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.412609	-23.824578	marine
PGSBP2	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.4131	-23.824949	marine
PGUBP1	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.060145	-23.466834	marine
PGUBP2	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.060127	-23.466831	marine
PGUBP3	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.060104	-23.466854	marine
PGUBP4	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.060094	-23.466893	marine
PP1I1	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.500248	48.493018	marine
PP1I2	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.50058	48.492827	marine
PP1I3	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.496102	48.49427	marine
PP1I4	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.4997	48.4938	marine
PP2I1	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.49554	48.496957	marine
PP2I2	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.495416	48.497064	marine
PP2I3	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.495425	48.497064	marine
PP2I4	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.49521	48.497256	marine
PP2M1	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.494759	48.497597	marine
PP2M2	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.494574	48.497686	marine

Table 1: Continued

foodweb name	study site	geographic location	citation	longitude	latitude	ecosystem type
PP2M3	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.494421	48.497783	marine
PP2M4	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.49426	48.497865	marine
RMP1	Intertidal rocky pools	Madeira	(Vinagre et al., unpublished)	-16.823898	32.645518	marine
RMP2	Intertidal rocky pools	Madeira	(Vinagre et al., unpublished)	-16.823913	32.645521	marine
RMP3	Intertidal rocky pools	Madeira	(Vinagre et al., unpublished)	-16.824067	32.645613	marine
RMP4	Intertidal rocky pools	Madeira	(Vinagre et al., unpublished)	-16.824114	32.645638	marine
RMP5	Intertidal rocky pools	Madeira	(Vinagre et al., unpublished)	-16.824072	32.645678	marine
RV1P1	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.475228	38.702144	marine
RV1P2	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.475282	38.702092	marine
RV1P3	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.475079	38.702141	marine
RV1P4	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.474987	38.702162	marine
RV2P1	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.474501	38.701839	marine
RV2P2	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.474395	38.701801	marine
RV2P3	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.474304	38.701801	marine
RV2P4	Intertidal rocky pools	Portugal	(Vinagre et al., unpublished)	-9.474294	38.70178	marine
SF1I1	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.230795	48.612351	marine
SF1I2	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.231071	48.612273	marine
SF1I3	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.230793	48.612238	marine
SF1I4	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.230795	48.612345	marine
SF1M1	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.230525	48.612117	marine
SF1M2	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.230438	48.612209	marine
SF1M3	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.230501	48.612074	marine
SF1M4	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.230736	48.612159	marine
SF2I1	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.22929	48.612671	marine
SF2I2	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.229356	48.612735	marine
SF2I3	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.229291	48.612756	marine
SF2I4	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.229228	48.612827	marine
SF2M1	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.22975	48.612437	marine
SF2M2	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.229598	48.612451	marine
SF2M3	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.229489	48.612572	marine

Table 1: Continued

foodweb name	study site	geographic location	citation	longitude	latitude	ecosystem type
SF2M4	Intertidal rocky pools	Canada	(Vinagre et al., unpublished)	-68.229777	48.612274	marine
SP1	Intertidal rocky pools	Brazil (SP)	(Vinagre et al., unpublished)	-45.423545	-23.828842	marine
WP1	Intertidal rocky pools	England	(Vinagre et al., unpublished)	-4.083361	50.31675	marine
WP2	Intertidal rocky pools	England	(Vinagre et al., unpublished)	-4.083136	50.316709	marine
WP3	Intertidal rocky pools	England	(Vinagre et al., unpublished)	-4.082964	50.316572	marine
WP4	Intertidal rocky pools	England	(Vinagre et al., unpublished)	-4.082385	50.316449	marine
Skipwith Pond	Skipwith Pond	United Kingdom; Skipwith Common, North Yorkshire	(Warren 1989)	-0.997596	53.827343	lakes

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Table 2: Species traits and ecosystem variables used in this study.

Variable	**Variable levels**
Predator or prey metabolic group	ectotherm vertebrate, endotherm vertebrate, invertebrate
Predator or prey movement type	swimming, walking, flying, sessile
Ecosystem type	lakes, marine, streams, terrestrial aboveground, terrestrial belowground
Interaction dimensionality	2D (interactions occur on a two-dimensional search space), 3D (interactions in a three-dimensional search volume)

Table 3: Parameters of the six predator-prey body-mass scaling models with one cofactor. Results for Bayesian major axis regressions and Bayesian mixed major axis regressions are reported by the mean estimate and 95% CIs. All slopes have p<0.001 (posterior probabilities P(a<0) or P(a>0), respectively).

	slope			intercept		
	mean	**2.5%**	**97.5%**	**mean**	**2.5%**	**97.5%**
Bayesian major axis	1.315	1.307	1.323	2.171	2.147	2.194
Bayesian ma + predator metabolism						
ectotherm vertebrate	0.457	0.450	0.464	2.683	2.667	2.700
endotherm vertebrate	0.714	0.692	0.736	2.920	2.876	2.966
Invertebrate	0.946	0.939	0.953	0.585	0.562	0.607
Bayesian ma + prey metabolism						
ectotherm vertebrate	2.004	1.915	2.098	-0.779	-0.980	-0.585
endotherm vertebrate	0.910	0.704	1.148	1.359	0.732	1.912
Invertebrate	1.500	1.489	1.511	2.786	2.753	2.820
Bayesian ma + predator movement						
Flying	1.277	1.221	1.334	2.807	2.670	2.947
Sessile	1.221	1.144	1.304	1.864	1.682	2.057
Swimming	1.154	1.144	1.164	2.704	2.679	2.729
Walking	0.941	0.932	0.950	0.540	0.510	0.570
Bayesian ma + prey movement						
Flying	1.663	1.568	1.768	3.039	2.779	3.319
Sessile	1.029	0.962	1.100	1.297	1.235	1.358
Swimming	1.189	1.178	1.201	2.468	2.437	2.499
Walking	1.338	1.326	1.350	2.113	2.073	2.153
Bayesian ma + ecosystem type						
Lakes	0.764	0.735	0.793	2.587	2.461	2.705
Marine	1.266	1.254	1.277	2.132	2.109	2.156
Stream	5.573	5.203	5.963	18.093	16.792	19.453
terrestrial aboveground	1.788	1.736	1.843	2.917	2.780	3.058
terrestrial belowground	0.863	0.848	0.878	0.286	0.228	0.344
Bayesian ma + interaction dimensionality						
2D	1.241	1.232	1.251	1.733	1.703	1.763
3D	1.227	1.215	1.239	2.700	2.666	2.734

Table 3: continued.

	slope			Intercept		
	mean	**2.5%**	**97.5%**	**mean**	**2.5%**	**97.5%**
Bayesian mixed major axis	1.433	1.420	1.446	2.581	1.930	3.237
Bayesian mixed ma + predator metabolism						
ectotherm vertebrate	0.247	0.238	0.255	2.169	1.688	2.642
endotherm vertebrate	0.252	0.220	0.286	2.938	2.251	3.606
Invertebrate	0.988	0.978	0.999	0.770	0.515	1.014
Bayesian mixed ma + prey metabolism						
ectotherm vertebrate	4.504	4.001	5.086	-2.908	-4.740	-0.815
endotherm vertebrate	0.753	0.492	1.030	1.805	0.886	2.741
Invertebrate	1.689	1.673	1.706	3.484	2.615	4.345
Bayesian mixed ma + predator movement						
Flying	2.030	1.869	2.211	2.411	-0.121	4.706
Sessile	1.086	0.994	1.184	1.830	0.910	2.828
Swimming	1.475	1.459	1.491	3.418	2.437	4.406
Walking	0.858	0.845	0.870	0.625	0.222	1.028
Bayesian mixed ma + prey movement						
Flying	2.848	2.571	3.175	2.632	-0.128	5.239
Sessile	0.321	0.256	0.388	0.742	-0.212	1.726
Swimming	1.681	1.657	1.705	2.812	1.716	3.861
Walking	1.224	1.206	1.241	2.073	1.631	2.525
Bayesian mixed ma + ecosystem type						
Lakes	0.950	0.912	0.989	1.597	0.307	2.889
Marine	1.533	1.506	1.540	2.478	1.527	3.415
Stream	6.578	6.033	7.199	2.833	-1.246	6.890
terrestrial aboveground	2.652	2.525	2.786	2.146	-0.613	4.756
terrestrial belowground	0.850	0.836	0.864	0.094	-0.715	1.310
Bayesian mixed ma + interaction dimensionality						
2D	1.175	1.159	1.192	1.816	1.444	2.193
3D	1.681	1.658	1.705	2.917	1.894	3.930

Table 4: Parameters of the predator-trait model.
The Bayesian major axis regression model predicts predator-prey body-mass ratios depending on (1) the continuous variable predator body mass (gram fresh weight) and all possible combinations of the cofactors (2) predator metabolic type and (3) predator movement type across (4) all ecosystem types. Number of data points used for the regression models (n), mean estimate and 95% CI.

		slope			**intercept**		
Cofactor combination	**n**	**mean**	**2.5%**	**97.5%**	**mean**	**2.5%**	**97.5%**
1) marine							
swimming ectotherm vertebrates	16204	-0.781	-0.812	-0.752	4.832	4.757	4.909
swimming endotherm vertebrates	800	-0.298	-0.457	-0.155	4.295	3.605	5.078
walking endotherm vertebrates	179	-2.314	-3.006	-1.724	9.073	7.447	10.937
sessile invertebrates	1266	-0.054	-0.131	0.018	1.568	1.493	1.643
swimming invertebrates	8662	0.005	-0.011	0.021	0.704	0.660	0.748
walking invertebrates	8210	-0.163	-0.198	-0.130	0.683	0.653	0.714
2) lakes							
swimming ectotherm vertebrates	1373	-3.651	-4.012	-3.329	10.409	9.905	10.962
swimming endotherm vertebrates	8	-1.033	-2.404	0.132	2.754	-0.221	5.966
swimming invertebrates	715	-0.211	-0.269	-0.157	0.367	0.146	0.581
walking invertebrates	237	-0.077	-0.281	0.099	0.535	0.258	0.781
3) streams							
swimming ectotherm vertebrates	2088	-4.638	-5.737	-3.693	10.363	9.139	11.773
sessile invertebrates	188	-1.047	-1.797	-0.379	-3.304	-5.889	-1.007
swimming invertebrates	95	0.058	-0.794	0.741	0.690	-2.210	3.004
walking invertebrates	3191	0.752	0.692	0.811	2.975	2.796	3.150
4) terrestrial aboveground							
walking ectotherm vertebrates	236	-1.942	-3.363	-0.959	4.403	3.464	5.720
flying endotherm vertebrates	1499	-2.015	-2.310	-1.749	6.442	5.981	6.961
walking endotherm vertebrates	111	-2.285	-2.907	-1.729	10.984	8.963	13.214
flying invertebrates	2143	0.242	0.126	0.349	1.886	1.735	2.028
walking invertebrates	7520	-0.896	-1.012	-0.787	-1.879	-2.165	-1.613
5) terrestrial belowground							
walking invertebrates	33472	-0.159	-0.175	-0.143	0.330	0.281	0.379

Note that statistical models were fit as: log10 (resource mass) ~ a + b * log10 (predator mass) for all possible combinations of predator metabolic type and predator movement type. This avoids effects of having predator mass as the independent and dependent (in the predator-prey mass ratio) variable. The slope of the model (given in the table above): log10 (predator-prey mass ratio) ~ -a + c * log10 (predator mass) is calculated by: c = 1 – b.

Supplementary statistical methods

We analysed our data set for the relationship between the log10 predator body mass [gram fresh weight], M_{pred}, and the log10 prey body mass [gram fresh weight], M_{prey}. We started with the simple scaling model without cofactors:

$$\log10\ M_{pred} = a + b * \log10\ M_{prey}$$

where a is the intercept and b the slope of the linear relationship. We compared the fit of this simple scaling model to six models that each included one cofactor: ecosystem type, predator or prey metabolic type, predator or prey movement type or interaction dimensionality. These interactive linear models resulted in different intercepts and slopes for each level of the cofactors.

We used Bayesian methods for parameter estimation, i.e. we computed the posterior distribution of the parameters θ observing the data

$$P(\theta|\text{data}) = P(\text{data}|\theta) * P(\theta) / P(\text{data}),$$

where $P(\text{data}|\theta)$ denotes the likelihood function, $P(\theta)$ is the parameters' prior distribution and $P(\text{data})$ is a constant. Samples from the posterior distribution were drawn using Hamiltonian Monte Carlo sampling in Stan (version 2.14.2), accessed via the RStan package (Stan Development Team 2016) in R (version 3.4.2).

For the Bayesian major axis regression, intercept a and slope b are sought which minimize the sum of squared orthogonal distances of the observations (x,y) to the regression line (Warton et al. 2006). For any observation, the nearest point on the line is given by $x^*=(y+x/b-a)/(b+1/b)$ and $y^*=a+bx^*$ (orthogonal projection). The residuals are the Euclidean distances $d((x,y),(x^*,y^*))$ between the observations and their projections on the regression line and are modelled normally distributed with zero mean and standard deviation σ, which defines the likelihood function. We used vague priors for slope and intercept based on the values from Brose et al. (2006): for a we used a normal distribution (mean 1.80, standard deviation 2.0) as well as for b (mean 1.16, standard deviation 2.0). For the residuals' standard deviation σ, a positive half-Cauchy prior (location 0.0, scale 2.0) was chosen (Gelman and Hill 2006). We emphasize that, given 88,489 observations, the posterior distribution is generally dominated by the likelihood and the choice of the priors has only marginal influence on the results.

For the Bayesian major axis regression including n_{cof} cofactor levels, each level *cof* gets its own slope and intercept. The priors for each intercept a_{cof} and each slope b_{cof} were defined as above.

The Bayesian mixed major axis regression included random intercepts a_{study} for each of the 23 studies and a fixed slope b. Each a_{study} is normally distributed with joint mean μ^a and joint standard deviation σ^a, which are free parameters and their posterior distributions are computed during the sampling routine. As priors we chose a normal distribution for μ^a (mean 1.80, standard deviation 2.0, see above) and a half-Cauchy distribution for σ^a (location 0.0, scale 2.0). The prior for the fixed slope b was defined as above.

For the Bayesian mixed major axis regression including n_{cof} cofactor levels, we modelled the variable *study* nested in the variable *cof*. Each study in a respective cofactor level was provided a random intercept $a_{cof,study}$, which has a joint normal distribution with all studies' intercepts in the respective cofactor level (mean $\mu^a{}_{cof}$, standard deviation $\sigma^a{}_{cof}$). Each of the n_{cof} means $\mu^a{}_{cof}$ was given a normally distributed prior (mean 1.80, standard deviation 2.0, see above) and each of the n_{cof} standard deviations $\sigma^a{}_{cof}$ was given a half-Cauchy prior (location 0.0, scale 2.0). The priors for the n_{cof} fixed slopes b_{cof} were defined as above.

For each model, we ran 3 Markov chains in parallel with an adaptation phase of 1,000 iterations and 20,000 sampling iterations each, summing up to 30,000 samples of the posterior distribution. We confirmed convergence by visual inspection of the trace plots and density plots, which showed a good mixture of the chains, and by verifying values of R sufficiently close to 1 and an adequate effective sampling mass n_{eff}. For model comparison we used the Watanabe-Akaike information criterion (WAIC), which was computed from the from the log-likelihood values of the posterior samples using the loo package (Vehtari et al. 2016)**.**

References Supplementary Methods

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Supplementary data: GATEWAy metadata

Variable name	Variable definition	Storage type	Missing value codes
autoID	Unique ID for each consumer resource interaction	Integer	NA
link.citation	Citation for the trophic link between consumer and resource	Character	NA
link.methodology	How was the trophic link established: published account (e.g., journal, book, internet), expert (data obtained from expert knowledge), field (direct observation in the field), extrapolated from similar taxa, gut/stomach analysis, scat analysis, pellet analysis, tracer study, feeding trial, rearing, natural history (e.g., morphological information)	Character	NA
interaction.type	Classification of the interaction (Note: this is not a classification of consumer or resource) by type: predacious, parasitoid, parasitic, herbivorous, detritivorous, bacterivorous, fungivorous, pathogen (bacteria and fungi)	Character	NA
interaction.dimensionality	Classification of the interaction (not consumer or resource) by the dimensionality the search space (2D) or search volume (3D)	Character	NA
Interaction.classification	Classification of the interaction (not consumer or resource) as indiviudal-based intake and attack (ibi) or non-individual-based intake and attack (nibi)	Character	NA
con.taxonomy	Highest available taxonomic resolution description of the consumer species	Character	NA
con.taxonomy.level	Level of taxonomic resolution (e.g., class, order, family, genus, species)	Character	NA
con.common	Common name of the consumer	Character	NA
con.lifestage	Lifestage of the consumer: adults, juveniles, larvae, nymphs, nauplii.	Character	NA
con.metabolic.type	invertebrate, ectotherm vertebrate, endotherm vertebrate, primary producer, heterotrophic bacteria, heterotrophic fungi.	Character	NA
con.movement.type	walking, swimming, flying, sessile, other	Character	NA
con.size.citation	Reference for the body sizes of consumer	Character	NA
con.size.method	Methodology of body size measurement of the consumer: measurement (individuals are field-sampled and masses are measured), regression (weight-length regression with measured	Character	NA

	lengths), published account (e.g., field guide), expert (data obtained from expert knowledge).		
con.length.min[cm]	Minimum length measured of the consumer	Floating Point	NA
con.length.mean[cm]	Mean length of the consumer population that is involved in this trophic interaction – this can be all individuals of a species or sub-groups such as adults	Floating Point	NA
con.length.max[cm]	Maximum length measured of consumer	Floating Point	NA
con.mass.min[g]	Minimum mass measured	Floating Point	NA
con.mass.mean[g]	Mean mass of the population that is involved in this trophic interaction – this can be all individuals of a species or sub-groups such as adults	Floating Point	NA
con.mass.max[g]	Maximum mass measured	Floating Point	NA
res.taxonomy	Taxonomic description of the resource species	Character	NA
res.taxonomy.level	Level of taxonomic resolution (e.g., class, order, familiy, genus, species)	Character	NA
res.common	Common name of the resource if applies	Character	NA
res.lifestage	Characterizes the lifestage of the species that is involved in the trophic interaction: adults, juveniles, larvae, nymphs, pupae, nauplii, eggs.	Character	NA
res.metabolic.type	invertebrate, ectotherm vertebrate, endotherm vertebrate, primary producer, heterotrophic bacteria, heterotrophic fungi, detritus, dead organic material, other	Character	NA
res.movement.type	walking, swimming, flying, sessile, floating, other	Character	NA
res.size.citation	Reference for the body sizes of resource	Character	NA
res.size.method	Methodology of body size measurement of the resource: measurement (individuals are field-sampled and masses are measured), regression (weight-length regression with measured lengths), published account (e.g., field guide), expert (data obtained from expert knowledge).	Character	NA
res.length.min[cm]	Minimum length measured of the resource	Floating Point	NA
res.length.mean[cm]	Mean length of the population that is involved in this trophic interaction – this can be all individuals of a species or sub-groups such as adults	Floating Point	NA
res.length.max[cm]	Maximum length measured	Floating Point	NA
res.mass.min[g]	Minimum mass measured	Floating Point	NA

res.mass.mean[g]	Mean mass of the population that is involved in this trophic interaction – this can be all individuals of a species or sub-groups such as adults	Floating Point	NA
res.mass.max[g]	Maximum mass measured	Floating Point	NA
geographic.location	Most detailed description of where the study took place that is available (country, region, city, etc.)	Character	NA
longitude	In degrees	Floating point	NA
latitude	In degrees	Floating point	NA
ecosystem.type	Broad habitat description: terrestrial aboveground, terrestrial belowground, lakes, streams, marine	Character	NA
study.site	Most detailed description of the study site	Character	NA
altitude	If above sea level	Floating point	NA
depth	For aquatic studies, depth below water level (marine or freshwater)	Floating point	NA
sampling.time	Description of study time as accurate as possible (Year, month, day).	Character	NA
sampling.start.year	Year when study began	Integer	NA
sampling.end.year	Year when study ended	Integer	NA
notes	Additional information	Character	NA
foodweb.name	Name of the food web	Character	NA